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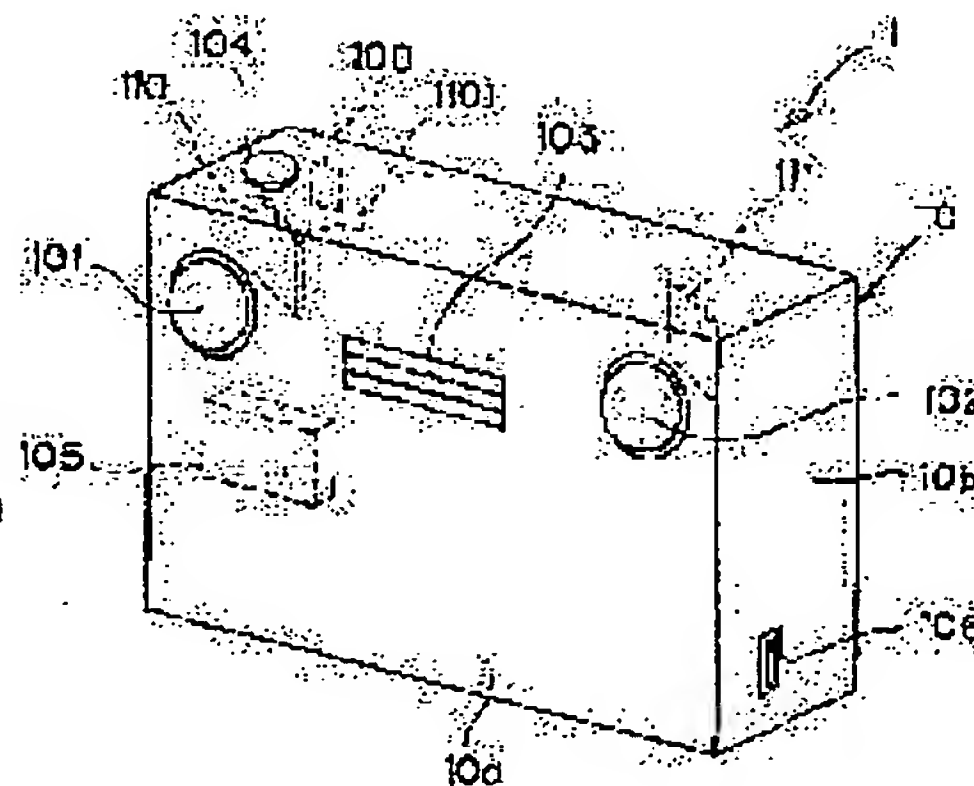
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(54) DIGITAL CAMERA

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a thin-type digital camera which can obtain a photograph of high image quality, when an object is magnified, regarding a digital camera which switches over a wide angle type and a telescopic type.

SOLUTION: The digital camera is equipped with a main body 10, whose thickness is less than at least one out of the longitudinal dimension and the transversal dimension of the front, an imaging element 100, a first photographing lens 101, a second photographing lens 102 which is arranged on a body front surface 10a or a side surface 10b and has a focal length longer than that of the first lens 101, and a photographing lens switching optical system 110, which is movable between a first



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switching state and a second switching state. In the first switching state, a first optical path, where a first photographing light taken in from the first lens 101 reaches the element 100, is intercepted, and a second photographing light taken in from the second lens 102 is guided to the element 100 via a second optical path, containing an optical path parallel to is the front surface 10a of the body part 10. The second switching state is retreated from the first optical path and intercepts the second optical path.

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CLAIMS [Claim(s)]

[Claim 1]

The main body with a thickness dimension smaller than one [at least] dimension of the front in-every-direction side dimensions, The image sensor which changes into an electrical signal the light-receiving light arranged to the interior of said main body, The 1st photographing lens which incorporates the 1st photography light arranged in said front face of the main body, Incorporate the 2nd photography light arranged on said front face of the main body or side face. While the 1st photography light incorporated rather than said 1st photographing lens from the 2nd photographing lens of a long focus and said 1st photographing lens interrupts the 1st optical path which reaches to said image sensor. The digital camera is characterized by having the photographing lens switching optical system which can move freely between the 2nd switching state which interrupts said 2nd optical path while evacuating from said 1st optical path and the 1st switching state which leads the 2nd photography light incorporated from said 2nd photographing lens to said image sensor via the 2nd optical path including an optical path parallel to the front face of said main body.

[Claim 2]

The digital camera according to claim 1 characterized by having the image display section constituted free [rotation] so that said image could be turned to itself also in any at the time of turning to oneself when said 1st photographing lens which displays the image based on the electrical signal acquired with said image sensor is turned ahead.

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DETAILED DESCRIPTION [Detailed Description of the Invention]

[0001]

[Field of the Invention]

This invention relates to the digital camera of a wide angle and a looking-far change mold.

[0002]

[Description of the Prior Art]

Conventionally, in consideration of portability, a camera tends to be thinner as much as possible. In the digital camera which is made to carry out image formation of the image of a photographic subject on an image sensor, and captures an image as a signal, since the image sensor is small, the focal distance of a photographing lens is short and it ends, and to reduce the thickness of a camera is comparatively easy.

[0003]

[Problem(s) to be Solved by the Invention] By the way, in various scenes in photography, he sometimes wants to photo a photographic subject greatly even from a distance plentifully, and, for this reason, the digital camera carrying a telephoto lens is also known. In a telephoto lens, if it will be necessary to take a long focal distance and the digital camera for which thin-shape-izing must have been comparatively easy also tends to carry such a telephoto lens the more the more it sets up a scale factor greatly, thin shape-ization will become difficult.

[0004] the electron which trims the central field of within the limit [photography screen] which are indicated by JP 11-284903 A, and is extended to the magnitude of a photography screen frame apart from an optical expansion of the photographic subject by the telephoto lens on the other hand as a technique of acquiring the photograph to which the photographic subject was expanded -- a zoom -- the technique is known. For this reason, this electronic zoom technique is a technique of expanding the image captured with the photographing lens, even if it does not take the long focal distance of a photographing lens, it can acquire the photograph to which the photographic subject was expanded, and it does not almost have barring thin shape-ization of a camera. Moreover, in a digital camera, since an image is captured as a signal, this electronic zoom technique can be applied in the phase of signal processing, and it can be said that an electronic zoom technique is a technique suitable for a digital camera. However, since an electronic zoom technique is a technique which extends the image once captured to the camera, the more an enlargement scale factor becomes high, the more it has the problem of producing degradation of image quality.

[0005] This invention aims at offering the thin-shaped digital camera which can obtain a

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high definition thing also with the photograph to which the photographic subject was expanded in view of the above-mentioned situation.

[0006]

[Means for Solving the Problem] The digital camera of this invention which attains the above-mentioned purpose The main body with a thickness dimension smaller than one [at least] dimension of the front in-every-direction side dimensions, The image sensor which changes into an electrical signal the light-receiving light arranged to the interior of the above-mentioned main body, The 1st photographing lens which incorporates the 1st photography light arranged in the above-mentioned front face of the main body, Incorporate the 2nd photography light arranged on the above-mentioned front face of the main body, or the side face. While the 1st photography light incorporated rather than the 1st photographing lens of the above from the 2nd photographing lens and 1st photographing lens of the above of a long focus interrupts the 1st optical path which reaches to the above-mentioned image sensor The 1st switching state which leads the 2nd photography light incorporated from the 2nd photographing lens of the above to the above-mentioned image sensor via the 2nd optical path including an optical path parallel to the front face of the above-mentioned main body, While evacuating from the 1st optical path of the above, it is characterized by having the photographing lens switching optical system which can move freely between the 2nd switching state which interrupts the 2nd optical path of the above.

[0007] The digital camera of this invention is including an optical path parallel to the front face of the above-mentioned main body in the 2nd optical path of the above, while arranging the 2nd photographing lens of the above on the front face or side face of the above-mentioned main body apart from the 1st photographing lens of the above, and the optical path of the length required as a telephoto lens is secured, realizing thin shape by shortening the dimension of the thickness direction of the above-mentioned main body.

[0008] Moreover, in the digital camera of this invention, when the 1st photographing lens of the above which displays the image based on the electrical signal acquired with the above-mentioned image sensor is turned ahead, it is desirable that it is the mode equipped with the image display section constituted free [rotation] so that the above-mentioned image could be turned to itself also in any at the time of turning to oneself.

[0009] In the above-mentioned mode, even if it is the so-called confrontation photography at the time of turning the 1st photographing lens of the above to oneself even if it was photography at the time of turning the 1st photographing lens of the above ahead, it has the advantage that the above-mentioned image is legible also in photography [which].

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[0010]

[Embodiment of the Invention] Hereafter, the embodiment of the invention of this invention is explained.

[0011] The appearance perspective view which looked at the digital camera whose Fig. 1 is the 1st embodiment of the invention of this invention from front slant, and Fig. 2 are the appearance perspective views which looked at the camera of Fig. 1 from tooth-back slant.

[0012] the CMOS sensor 100 was used for the digital camera 1 of this embodiment of the invention as an image sensor which changes light-receiving light into an electrical signal — it is the digital camera of a low price comparatively. This digital camera 1 consists of the main body 10 which has the relation of die length called width-of-face (width) > height (length) > depth (thickness). Two photographing lenses located in a line with right and left are arranged by front 10a of this main body 10. The lens arranged on the right-hand side of front 10a near the CMOS sensor 100 between these two photographing lenses (Fig. 1 top left-hand side) is the pre-group wide angle lens 101. The lens arranged on the other hand on the left-hand side of front 10a which is separated from the CMOS sensor 100 (Fig. 1 top right-hand side) is the pre-group telephoto lens 102. Moreover, in the center section of front 10a of the main body 10, the flash light-emitting part 103 which emits light in a flash towards the front of these photographing lenses 101, 102 is arranged. The flash light-emitting part 103 emits light in a flash by turning on a non-illustrated flash luminescence switch synchronizing with release actuation.

[0013] In the upper side face, the release carbon button 104 is arranged among the side faces which enclose front 10a of the main body 10 of this digital camera 1. By this release carbon button 104 being pushed, the image information based on the electrical signal changed by the CMOS sensor 100 is recorded on the archive medium 105 built in the main body 10.

[0014] Moreover, in side-face 10b on the left-hand side of the main body 10 of this digital camera 1, it is Universal. Serial The output terminals 106, such as a Bus (USB) terminal, are arranged. In this digital camera 1, it can be made to be able to go via the non-illustrated cable by which the image information based on the electrical signal acquired by the CMOS sensor 100 is connected to this output terminal 106, and can output to a personal computer, television, a projector, etc.

[0015] As shown in Fig. 2, the image display section 107, the Main electric power switch 108, and the mode circuit changing switch 109 are formed in the tooth back of the main body 10 of this digital camera 1. The image display section 107 is a liquid

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crystal display panel which displays the image based on the electrical signal acquired by the CMOS sensor 100, and it is also bearing the role which displays the photoed image while it plays a role of a finder. The Main electric power switch 108 is operated, and is a handler which turns on / turns off the main power supply of this digital camera 1. The mode circuit changing switch 109 is operated, and is a handler which sets this digital camera 1 as various modes. The function of an electronic zoom is added to this digital camera 1 in the range which can guarantee sufficient high definition, and the 1.2 time mode which trims a central field, with the aspect ratio of a photography screen frame maintained, and is expanded by 1.2 times, and the 1.4 time mode which trims a central field more smallish than the time of this 1.2 time mode, and is expanded by 1.4 times are prepared in various modes. Moreover, the panorama mode in which change an aspect ratio and an image is expanded oblong is also prepared for this digital camera 1. [0016] Moreover, the reflective mirror 110 and the radar clutter mirror 111 are built in the main body 10 of this digital camera 1. This reflective mirror 110 can rotate the rotation medial axis 1101 freely to a termination. On the other hand, the radar clutter mirror 111 is fixed to the posture in which it has the include angle of 45 degrees to the optical axis of the pre-group telephoto lens 102. Furthermore, in Fig. 1, although the illustration abbreviation was carried out, as shown in Fig. 2, the zoom change dial 112 is arranged in the side face of the main body 10 top. An index 1121 is formed in this zoom change dial 112, and rotation actuation is free for the zoom change dial 112. Therefore, it is also free by carrying out rotation actuation of the zoom change dial 112 to also unite the index 1121 with the location which T showing a call side (long distance side) described, and to unite with the location which W showing a wide side (short distance side) described. The rotation medial axis 1101 of the reflective mirror 110 shown in Fig. 1 is directly linked with the zoom change dial 112 in which such rotation actuation is free. Therefore, if rotation actuation of the zoom change dial 112 is carried out, the reflective mirror 110 will rotate the rotation medial axis 1101 to a termination. The digital camera 1 in the condition that the CMOS sensor 100 is receiving the photography light incorporated from the pre-group telephoto lens 102 is shown in Fig. 1. Here, the optical system of this digital camera is explained using Fig. 3. [0017] Fig. 3 is a conceptual diagram when seeing the optical system of the digital camera of the 1st embodiment of the invention from the top-face side of the main body. [0018] The optical system of this digital camera 1 has the telephoto lens optical system which turns into wide-angle-lens optical system which consists of a pre-group wide angle lens 101 and a rear group wide angle lens 113 arranged immediately behind that pre-group wide angle lens 101 from the rear group telephoto lens 114 which the

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photography light reflected by the pre-group telephoto lens 102, the radar clutter mirror 111, and the radar clutter mirror 111 passes, and the reflective mirror 110. If united with the location which T showing an index's 1121 of zoom change dial 112 call side (long distance side) described here, the reflective mirror 110 will become the posture which had the include angle of 45 degrees to the optical axis of the rear group telephoto lens 114 as shown in Fig. 3 (a), and the photography light incorporated from the pre-group wide angle lens 101 will interrupt the optical path which reaches to the CMOS sensor 100. Consequently, although the photography light incorporated from the pre-group telephoto lens 102 arrives at the light-receiving side of the CMOS sensor 100 in accordance with the optical path Lt including an optical path parallel to front 10a of the main body 10 as shown in Fig. 3 (a) according to a two-dot chain line, the photography light incorporated from the pre-group wide angle lens 101 is interrupted with the rear face of the reflective mirror 110 which became such a posture, and does not arrive at the light-receiving side of the CMOS sensor 100. Therefore, the image of a narrow predetermined field angle carries out image formation to the light-receiving side of the CMOS sensor 100. In addition, the optical path Lt shown according to this two-dot chain line is equivalent to the 2nd optical path said to this invention. Thus, with this embodiment of the invention, the pre-group telephoto lens 102 has been arranged in the location distant from the CMOS sensor 100 of front 10a, and the photography light incorporated with this pre-group telephoto lens 102 is drawn in the longest width-of-face (width) direction of the main body by making it reflect by the radar clutter mirror 111. Therefore, the optical path of die length required as a telephoto lens is secured, realizing thin shape by shortening the dimension of the depth (thickness) direction of the main body 10. For this reason, expanding to unreasonableness becomes unnecessary, so that it is less than permissible image quality with an electronic zoom, and a high definition thing can be obtained also with the photograph to which the photographic subject was expanded.

[0019] Moreover, if united with the location which W to which the zoom change dial 112 be operated and the index 1121 express a wide side (short distance side) described from the condition shown in Fig. 3 (a), it evacuate from the optical path which the photography light incorporated from the pre-group wide angle lens 101 reach to a CMOS sensor 100, and a reflective mirror 110 will become the posture which had the include angle of 90 degrees to the optical axis of the rear group telephoto lens 114 as shown in Fig. 3 (b). Consequently, although the photography light incorporated from the pre-group wide angle lens 101 arrives at the light-receiving side of the CMOS sensor 100 in accordance with the optical path Lw shown in Fig. 3 (b) with a dashed

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line, it is reflected on the front face of the reflective mirror 110, and the photography light incorporated from the pre-group telephoto lens 102 does not arrive at the light-receiving side of the CMOS sensor 100. Therefore, the image incorporated with the large field angle carries out image formation to the light-receiving side of the CMOS sensor 100. In addition, the optical path Lw shown with this dashed line is equivalent to the 1st optical path said to this invention.

[0020] Here, when the various above-mentioned modes formed in this digital camera 1 are used, the image displayed on the image display section 107 can be expanded, or an aspect ratio can be changed. Therefore, in this digital camera 1, a $2 \times 4 = 8$ kind image can be obtained by actuation of the zoom change dial 112, and actuation of the mode circuit changing switch 109.

[0021] Then, the 2nd embodiment of the invention of the digital camera 1 of this invention is explained using Fig. 4 and Fig. 5. In addition, in explanation of the following 2nd embodiment of the invention, the overlapping explanation is omitted using the same sign to the same component as the component mentioned above.

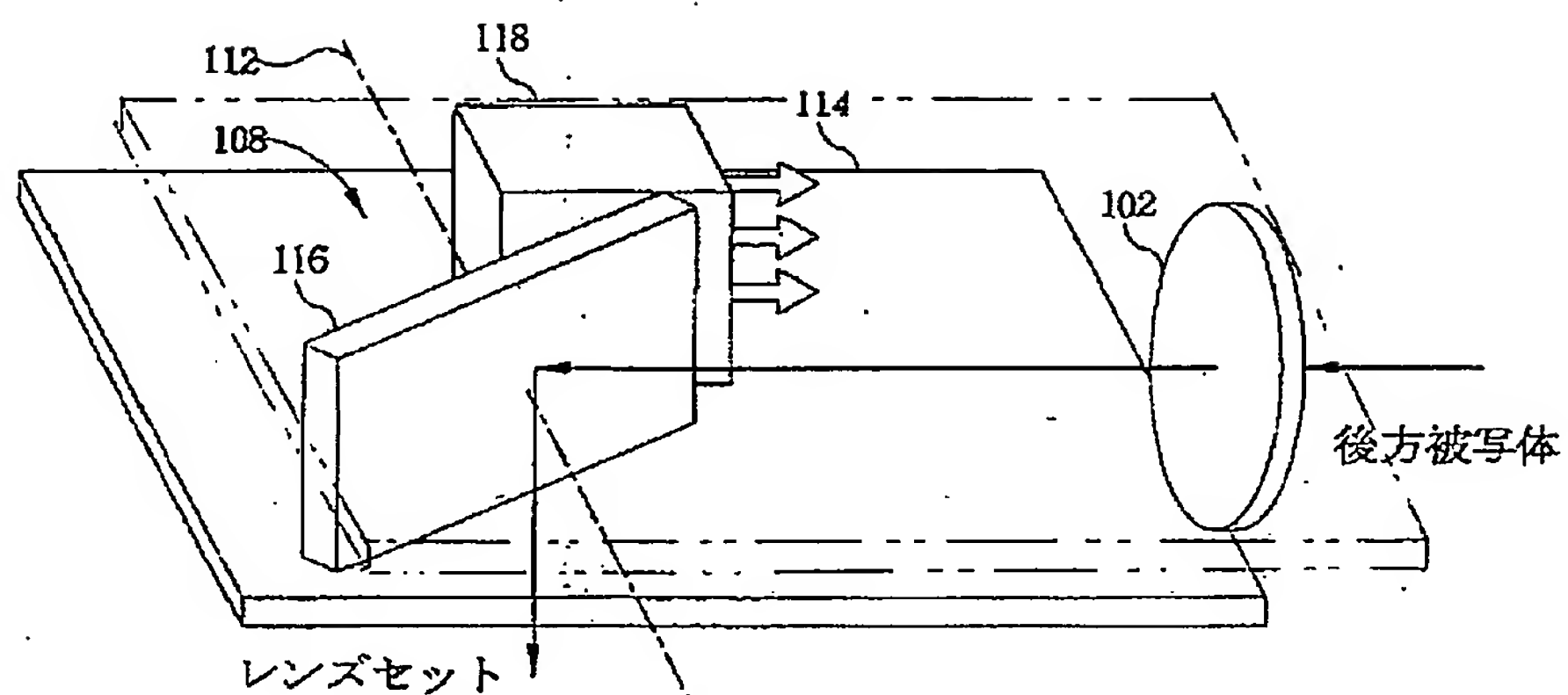
[0022] The appearance perspective view which looked at the digital camera whose Fig. 4 is the 2nd embodiment of the invention of this invention from front slant, and Fig. 5 are the appearance perspective views which looked at the camera of Fig. 4 from tooth-back slant.

[0023] The arrangement locations of the digital camera of the 1st embodiment of the invention and the pre-group telephoto lens 102 which mentioned above the digital camera 1 of this 2nd embodiment of the invention differ. That is, in this embodiment of the invention, the pre-group telephoto lens 102 is arranged at left lateral 10b of the main body 10. In addition, with the 1st embodiment of the invention, by this embodiment of the invention, the output terminal 106 prepared in the left lateral of the main body is formed in the right lateral of the main body 10, although the illustration abbreviation was carried out. Moreover, with this embodiment of the invention, the radar clutter mirror 111 (refer to Fig. 1 or Fig. 3) with which the interior of the digital camera of the 1st embodiment of the invention was equipped becomes unnecessary by having formed the pre-group telephoto lens 102 in left lateral 10b, and it has become optical system as shown in Fig. 6.

[0024] Fig. 6 is a conceptual diagram when seeing the optical system of the digital camera of the 2nd embodiment of the invention from the top-face side of the main body.

[0025] The optical system of the digital camera 1 of this 2nd embodiment of the invention has the telephoto lens optical system which consists of a pre-group telephoto lens 102 and a rear group telephoto lens 114, the wide-angle-lens optical system which

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